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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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GREGORY M. TAYLOR
WORKMAN, NYDEGGER & SEELEY
1000 EAGLE GATE TOWER
60 EAST SOUTH TEMPLE
SALT LAKE CITY, UT 84111

EXAMINER

ANDUJAR, LEONARDO

ART UNIT PAPER NUMBER

2826

DATE MAILED: 12/18/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/083,034

Applicant(s)

AKRAM, SALMAN

Examiner

Leonardo Andújar

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 November 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-44 is/are pending in the application.
- 4a) Of the above claim(s) 3-7, 10-12, 18, 20, 26, 29-33, 36-40 and 42- 44 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 8, 9, 13-17, 19, 21-25, 27, 28, 34, 35 and 41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 2.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election of species 7, figure 7 (claims 1, 2, 8, 9, 11-28, 34, 35, 41 and 43-44) in Paper No. 4 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)). Moreover, claims 11, 12, 18, 20, 26, 43 and 44 are withdrawn from consideration since they are not readable on the elected species

Priority

2. A statement reading "now US Patent No. 6,424,033 issued 07/23/2002" should be included after "1999" on page 1 line 2 of the specification.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1, 2, 8, 13-17, 19, 21-25, 27, 28, 34, 35 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chao et al. (US 5,633,535) in view of Hunadi et al.

5. Regarding claim 1, Chao (e.g. fig. 7) shows an integrated circuit IC chip package comprising:

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- A substrate 20 with an IC chip mounted thereon, wherein the IC chip has an active surface;
- And a container 40 disposed upon the substrate in contact with the active surface of the IC chip.

6. However, Chao does not disclose a grease in contact with the active surface of the chip. Hunadi discloses a chip a package comprising an IC chip mounted on a printed circuit board substrate having high thermal conductivity grease in contact with the active surface of the IC chip. According to Hunadi the flip chip and chip scale packages have penetrated a significant number of device designs due to their small form factor and ability to handle high input/output counts. Their migration into high speed microprocessor/microcontroller and high speed memory applications will require thermal management solutions beyond heat dissipation through solder joints and eventually through the printed circuit board. Hunadi discloses that high thermal conductivity greases can provide an optimum solution to the heat dissipation problem in small form factor devices by allowing the user to form a thin cross section of an interface material which is both low stress and removable (page 28/cols 1-3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a high thermal conductivity grease in contact with the active surface of the IC chip disclosed by Chao in order to provide an improved heat dissipation capability, and a low stress and/or removable interface as taught by Hunadi.

7. Regarding claims 2 and 8, Chao shows that the chip is a flip chip. Also, Hunadi discloses a flip chip on a flex substrate (page 28/cols. 1-3).

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8. Regarding claim 9, Chao discloses that the container comprises a dam structure that secures the container to the substrate.

9. Regarding 13, Hunadi (table 2) discloses that the grease has a thermal conductivity in a range from about 2 Watts/m K to about 5 Watts/m K.

10. Regarding 14, Hunadi (table 2) discloses that the grease has a dielectric constant of about 9.

11. Regarding 15, Hunadi discloses a high conductivity grease that inherently has a melting point. Nonetheless, Hunadi does not explicitly disclose the specific melting point. Hunadi use the same greases as that disclosed by applicant. Therefore, it is expected they will exhibit similar physical properties such as a melting point in a range from about 190 to 220 Celsius (pages 9-11). It would have been obvious to one of ordinary skill in the art at the time the invention was made to expect that the grease disclosed by Hunadi has a melting point in a range from about 190 to 220 Celsius since Hunadi use the same greases as that disclosed by applicant.

12. Regarding 16, Hunadi discloses that the grease has a weight loss at about 100 degree C after 30 days of less than about 0.15% (page 52, col. 1/lls. 1-6).

13. Regarding claim 17, Chao (e.g. fig. 7) shows an integrated circuit (IC) chip package with IC chip elements having an IC chip 10 with an active surface, the active surface having extending therefrom an electrical connector 42 in electrical communication with IC chip, the IC chip being mounted upon a substrate 20, the IC chip package comprising a container 40 disposed upon the substrate and enclosing a volume external to the IC chip elements. However, Chao does not disclose grease in

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contact with the active surface of the chip. Hunadi discloses a chip a package comprising an IC chip mounted on a printed circuit board substrate having high thermal conductivity grease in contact with the active surface of the IC chip. According to Hunadi the flip chip and chip scale packages have penetrated a significant number of device designs due to their small form factor and ability to handle high input/output counts. Their migration into high speed microprocessor/microcontroller and high speed memory applications will require thermal management solutions beyond heat dissipation through solder joints and eventually through the printed circuit board. Hunadi discloses that high thermal conductivity greases can provide an optimum solution to the heat dissipation problem in small form factor devices by allowing the user to form a thin cross section of an interface material which is both low stress and removable (page 28/cols 1-3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a high thermal conductivity grease in contact with the active surface of the IC chip disclosed by Chao in order to provide an improved heat dissipation capability and a low stress and removable interface as taught by Hunadi.

14. Regarding claims 19 and 21, Chao in view of Hunadi discloses that the grease is in contact with a dam structure.

15. Regarding claim 22, Hunadi (table 2) discloses that the grease has a thermal conductivity in a range from about 2 Watts/m K to about 5 Watts/m K.

16. Regarding 23, Hunadi (table 2) discloses that the grease has a dielectric constant of about 9.

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17. Regarding 24, Hunadi discloses a high conductivity grease that inherently has a melting point. Nonetheless, Hunadi does not explicitly disclose the specific melting point. Hunadi use the same greases as that disclosed by applicant. Therefore, it is expected they will exhibit similar physical properties such as a melting point in a range form about 190 to 220 Celsius (pages 9-11). It would have been obvious to one of ordinary skill in the art at the time the invention was made to expect that the grease disclosed by Hunadi has a melting point in a range form about 190 to 220 Celsius since Hunadi use the same greases as that disclosed by applicant.

18. Regarding 25, Hunadi discloses that the grease has a weight loss at about 100 degree C after 30 days of less than about 0.15% (page 52, col. 1/lis. 1-6).

19. Regarding claim 27, Chao discloses that the container makes contact with the substrate to enclose the active surface of the IC chip.

20. Regarding claims 28 and 34, Chao shows that the chip is a flip chip and the substrate is a printed circuit board. Also, Hunadi discloses a flip chip on a flex substrate (page 28/cols. 1-3).

21. Regarding claim 35, Chao discloses that the container comprises a dam structure that secures the container to the substrate.

22. Regarding claim 41, Chao (e.g. fig. 7) shows an integrated circuit (IC) chip package with an IC chip 10 with an active surface, the active surface having and electrical connections 42 extending therefrom in electrical communication with IC chip, the IC chip is mounted upon a substrate 20. Also, the IC chip package comprises a container 40 disposed upon the substrate and enclosing a volume external to the IC

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chip elements. However, Chao does not disclose a grease in contact with the active surface of the chip. Hunadi discloses a chip a package comprising an IC chip mounted on a printed circuit board substrate having high thermal conductivity grease in contact with the active surface of the IC chip. According to Hunadi the flip chip and chip scale packages have penetrated a significant number of device designs due to their small form factor and ability to handle high input/output counts. Their migration into high speed microprocessor/microcontroller and high speed memory applications will require thermal management solutions beyond heat dissipation through solder joints and eventually through the printed circuit board. Hunadi discloses that high thermal conductivity greases can provide an optimum solution to the heat dissipation problem in small form factor devices by allowing the user to form a thin cross section of an interface material which is both low stress and removable (page 28/cols 1-3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to include a high thermal conductivity grease in contact with the active surface of the IC chip disclosed by Chao in order to provide an improved heat dissipation capability and a low stress and removable interface as taught by Hunadi. Moreover, the grease disclosed by Hunadi has a thermal conductivity of 4.1 and a dielectric constant of 8.34. In regards to the melting point of the grease, Hunadi discloses a high conductivity grease that inherently has a melting point. Nonetheless, Hunadi does not explicitly disclose the specific melting point. Hunadi use the same greases as that disclosed by applicant. Therefore, it is expected they will exhibit similar physical properties such as a melting point in a range from about 190 to 220 Celsius (pages 9-11). It would have

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been obvious to one of ordinary skill in the art at the time the invention was made to expect that the grease disclosed by Hunadi has a melting point in a range from about 190 to 220 Celsius since Hunadi use the same greases as that disclosed by applicant.

Remarks

23. As said by applicant claims 11, 12, 18, 20, 26, 43 and 44 are readable on species 7 (figure 7). However, claims 11, 12, 18, 20, 26, 43 and 44 are withdrawn from consideration since they are not readable on the elected species. Claims 12 and 20 recites a container having a vent hole. According to the written description of figure 7 the vent hole may be formed in the substrate and not in the container (i.e. dam structure). Claims 26, 43 and 44 recites that the container comprises a metal. According to the written description of figure 7 the container (i.e. dam structure) is an epoxy material or glob top material and not a metal. Claims 26, 43 and 44 are readable on the embodiments that include a metal container such as figures 1, 3 and 5. Finally, claims 11 and 18 recites that the thermal conductivity of the grease is less than the container thermal conductivity. According to the specification, this description only applies to the embodiments wherein the container is made of metal. Note that epoxy or glob top materials are poor heat conductors.

Conclusion

24. Papers related to this application may be submitted directly to Art Unit 2826 by facsimile transmission. Papers should be faxed to Art Unit 2826 via the Art Unit 2826 Fax Center located in Crystal Plaza 4, room 3C23. The faxing of such papers must conform to the notice published in the Official Gazette, 1096 OG 30 (15 November

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1989). The Art Unit 2826 Fax Center number is **(703) 308-7722** or **-7724**. The Art Unit 2826 Fax Center is to be used only for papers related to Art Unit 2826 applications.

25. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Leonardo Andújar** at **(703) 308-0080** and between the hours of 9:00 AM to 7:30 PM (Eastern Standard Time) Monday through Thursday or by e-mail via Leonardo.Andujar@uspto.gov. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nathan Flynn, can be reached on (703) 308-6601.

26. Any inquiry of a general nature or relating to the status of this application should be directed to the **Group 2800 Receptionist** at **(703) 305-3900**.

27. The following list is the Examiner's field of search for the present Office Action:

Field of Search	Date
U.S. Class / Subclass (es): 257/685-687,690, 707, 712, 714, 718, 723, 787-789,795 and 796	12/02
Other Documentation:	
Electronic Database(s): East (USPAT, US PGPUB, JPO, EPO, Derwent, IBM TDB)	12/01

Leonardo Andújar

Patent Examiner Art Unit 2826

LA
12/7/02NATHAN J. FLYNN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800